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10/581,916

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03/28/2008

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EXAMINER

BEHM, HARRY RAYMOND

ART UNIT

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2838

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/581,916 | Applicant(s) EGUCHI ET AL. | |
| | Examiner HARRY BEHM | Art Unit 2838 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 January 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/4/08 has been entered.

Terminal Disclaimer

The terminal disclaimer filed on 1/3/08 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of application 10/579,468 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Drawings

The drawings were received on 1/3/08. These drawings are accepted.

Response to Arguments

Applicant's arguments, see sheet 7, filed 1/3/08, with respect to amended claim(s) 1-2 and Scheel have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However a new ground(s) of rejection is made in view of Meins (US 6,515,878).

Applicant's arguments with respect to Widener and claims 3 and 5 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claim 3 and Jang (US 6,934,167) have been considered but they are not persuasive. Applicant argues Jang discloses changing the switching frequency and does not disclose changing the on time. However, changing the switching frequency requires changing the on time and off time. As shown in Fig. 7 i_{LS} is balanced so that the resonant currents are nearly equal.

Applicant's arguments with respect to claims 1-3 and 5 and Eguchi (US 2007/0041222) have been considered but they are not persuasive, since Fig. 25 discloses a current detecting current transformer which detects the resonant current. However, upon further consideration, the reference is not applicable as a 102e reference since it is not by another inventive entity. Therefore, the rejection has been withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jang (US 6,934,167).

With respect to Claim 3, Jang discloses a bi-directional DC-DC converter comprising:

a transformer (Fig. 5 TR) having primary side terminals [connections to Vs], secondary side terminals [connections to Vo], a primary side winding (Fig. 5 Np), and a secondary side winding (Fig. 5 Ns) and determining a voltage converting ratio (Fig. 5 n);

a primary side pair of switching means (Fig. 5 SH,SL) interposed between said primary side terminals and said primary side winding; a

secondary side pair of switching means (Fig. 5 S1,S2) interposed between said secondary side terminals and said secondary side winding;

a primary side rectifying element [antiparallel diode] connected in parallel with each of switching elements in said primary side pair of switching means;

a secondary side rectifying element [anti-parallel diode] connected in parallel with each of switching elements in said secondary side pair of switching means; and

a driving means (Fig. 4 Primary-Current Feedback Frequency Control, PWM Output Voltage Feedback Control) for turning ON/OFF the switching elements in said primary side pair of switching means (Fig. 4 SH,SL) and the switching elements in said secondary side pair of switching means (Fig. 4 S1,S2), wherein: a LC resonant circuit (Fig. 5 Ls,Cs) is interposed between said secondary side winding and said secondary side pair of switching means;

a resonant current detecting means (Fig. 4 Primary Current Feedback) for detecting a resonant current caused by an operation of said LC resonant circuit and means for feeding a detected output of said resonant current detecting means back to said driving means (Fig. 4 Primary-Current Feedback Frequency Control) are provided; and

said driving means drives said primary side pair of switching means (Fig. 4 SH,SL) by correcting their on-state lapses of time so that their on-state resonant currents may be nearly equal to each other based on the detected output of said resonant current detecting means (Fig. 7 f shows the driving means adjusts the current to be nearly equal).

Jang does not disclose wherein the primary side is low voltage and the secondary side is high voltage. It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the turns ration (Fig. 5 n) such that $N_p < N_s$. The reason for doing so is to boost the output voltage

With respect to Claims 1 and 2, Jang discloses a DC-DC converter as set forth above. See claim 3 for additional details.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jang (US 6,934,167) in view of Falk (US 2002/0101747).

With respect to Claim 5, Jang discloses the DC-DC converter as set forth above. Jang does not disclose wherein the primary side switches are a full bridge. Falk teaches a bi-directional converter where the primary switches (Fig. 2 15) and secondary switches (Fig. 3 11) are configured as four switching elements in a bridge, since Falk teaches "the half bridge may be replaced by a full bridge" (paragraph 14). It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the primary and secondary switches as four switching elements in a bridge. The reason for doing so is to provide reverse power control from the active DC load to the primary input.

Claims 1-3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meins (US 6,515,878) in view of Falk (US 2002/0101747) and further in view of Loef (US 2003/0021127).

With respect to Claim 1, Meins discloses a DC-DC converter (Fig. 30) comprising:

a transformer (Fig. 30 transformer) having primary side terminals (Fig. 30 terminals across 107) , secondary side terminals (Fig. 30 terminals across active DC load), a primary side winding (Fig. 30 transformer coupled primary), and a secondary side winding (Fig. 30 secondary pickup unit for active DC load) and determining a voltage converting ratio;

a pair of switching means (Fig. 30 108-111) which is interposed between said primary side terminals and said primary side winding,

a LC resonant circuit (Fig. 30 secondary compensation for active DC load) comprised of a resonating reactor connected in series with said secondary side winding of said transformer, and a resonating capacitor that resonates with said resonating reactor; and

a driving means (Fig. 30 inverter control) for alternately turning said pair of switching means ON/OFF.

Meins does not disclose sensing I_{primary} . Loeff discloses a resonant DC-DC converter and teaches sensing (Fig. 1 22) the resonant current in the primary with a measuring device (Fig. 1 16) to determine the necessary operating parameters. It would have been obvious to one of ordinary skill in the art at the time of the invention to sense the primary current. The reason for doing so is “determining operating parameters of the power supply system” (Loeff paragraph 19) “The control device therefore preferably uses these previously determined parameters, so that a very precise control is possible.” (Loeff paragraph 22).

Meins does not disclose how the primary output converter is to be controlled by the inverter control. Falk discloses a resonant DC-DC converter that actively minimizes the compensating currents to reduce asymmetries. It would have been obvious to one of ordinary skill in the art at the time of the invention so that their on-state resonant currents may be nearly equal (Fig. 7 I) to each other based on the detected output of said resonant current detecting means. The reason for doing so is so “the transformer currents are almost half sine waves (Fig. 7) so that the currents may be switched lossless”, (Falk paragraph 31).

With respect to Claim 2, Meins in view of Loef and Falk disclose the DC-DC converter according to claim 1, wherein said resonant current detecting means (Loef Fig. 1 22) is provided on the primary side of said transformer.

With respect to Claim 3, Meins in view of Loef and Falk disclose a bi-directional DC-DC converter as set forth above. Loef discloses wherein a low voltage primary input is converted into a high voltage secondary.

With respect to Claim 5, Meins in view of Loef and Falk disclose a bi-directional DC-DC converter as set forth above, wherein low-voltage side switching means (Meins Fig. 30 108-111) are configured in a bridge as are the high-voltage switching means (Meins Fig. 30 active DC load pickup unit).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HARRY BEHM whose telephone number is (571)272-8929. The examiner can normally be reached on 7:00 am - 3:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm E. Ullah can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry Behm/
Examiner, Art Unit 2838

/Jeffrey L. Sterrett/
Primary Examiner, Art Unit 2838